Center Innovation Fund: KSC CIF

Visible Light Responsive Catalyst for Air & Water Purification (VLR)

Completed Technology Project (2011 - 2013)

Project Introduction

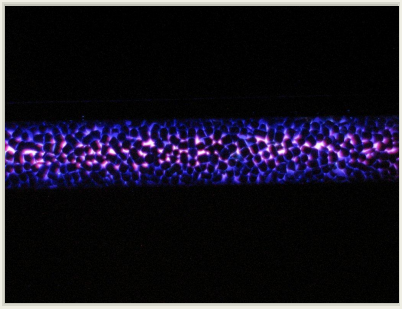
The objective for this project was to investigate and develop viable approaches to render the normally UV-activated titanium dioxide (TiO2) catalyst visible light responsive (VLR) and achieve high and sustaining catalytic activity under the visible region of the solar spectrum.

This study was aimed at the further development of visible light responsive catalysts by investigating new methods. A library of catalysts was developed and screened for gas and aqueous phase applications. This project focused on the development of novel photocatalysts, using multiple preparation methods, to be utilized in air and/or water purification reactors. Developed catalyst samples were tested for both applications and underwent vigorous physical characterization.

Top-performing samples were also compared to commercially available visible light responsive (VLR) catalysts. While photocatalysis is a well-developed technology for both air and water purification, most processes use bare titanium dioxide as the catalyst, which requires UV light for activation. By altering the wavelength of light needed for activation, solar radiation or highly-efficient LEDs can be better utilized while eliminating hazardous Hg-containing fluorescent lamps.

Anticipated Benefits

Relevance and value to NASA and the Nation from this project is that VLR-catalysts eliminate the hazards associated with UV radiation, enabling the use of long lasting and highly efficient blue or white LEDs, or renewable solar energy. VLR-photocatalysts could facilitate the development of the Photocatalytic Oxidation (PCO) technology for use in International Space Station (ISS) air revitalization and water recovery systems, reducing the overall life cycle costs of such systems, and potentially revolutionizing air and water recovery systems by integrating VLR-PCO into habitat structures (e.g. space wall). Success of the research could also enhance technologies for the indoor air quality control (e.g. managing “sick building syndrome”).



Although this shows a titania catalyst/sorbent bed in a glass tube with a UV lamp, the same principle would be applied with a blue (visible) light source. The air with trace contaminants is drawn through the photocatalytic reactors and…

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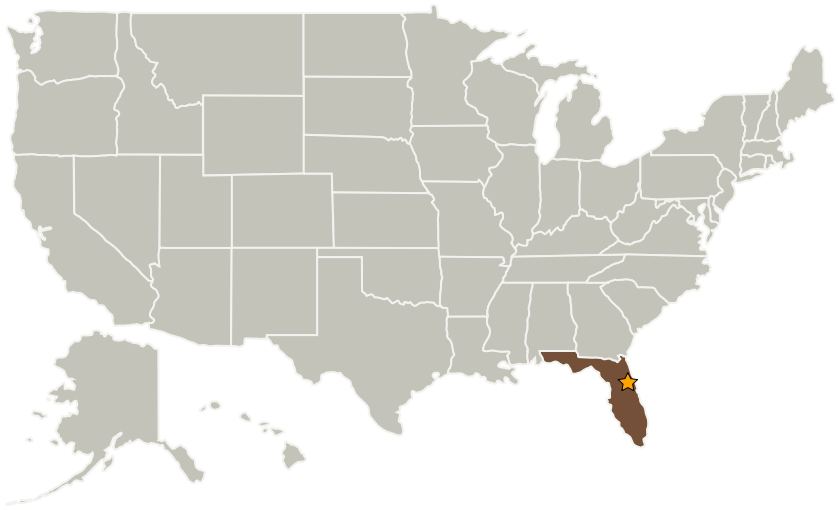
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
QinetiQ North America(QNA)	Supporting Organization	Industry	
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

Primary U.S. Work Locations
Florida

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Center Innovation Fund: KSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Barbara L Brown

Project Manager:

Raymond M Wheeler

Principal Investigator:

Paul E Hintze

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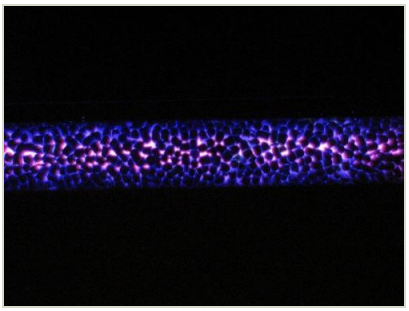
Images



Visible Light Responsive Catalyst for Air & Water Purification
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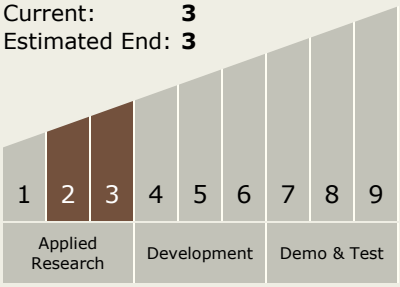
Links

Visible-Light-Responsive Catalyst for Water and Air Purification Publication (42nd Int'l Conference on Environmental Systems) *(http://arc.aiaa.org/doi/pdf/10.2514/6.2012-3629)*

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.5 Certification Methods